

of

for

[illegible]

Express Mail Label No. EF380711107US

TITLE OF INVENTION

Method of Performing Distributed Load Testing

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims priority under 35 U.S.C. §119(e) to provisional patent application serial number 60/209,235 filed June 5, 2000; the disclosure of which is incorporated by reference herein.

BACKGROUND OF THE INVENTION

In order to effectively exercise web sites or software components it is necessary to provide several loads to the web site or software component. A load can be thought of as a virtual user performing one or more transactions with the web site or software component. Prior methods utilize commonly owned systems which are on a common intranet to provide the desired load from various points on the network to the target web site or software component. While this presents sufficient load, it does so from the same points on the network continuously, thus access from different points of the network cannot be tested properly. In actual use the web site or software component would be accessed from a large variety of locations using different paths across the network, instead of fixed locations which may be limited to the same paths. Further, the prior art methods have required the service provider to purchase and maintain the multiple systems located across the network in order to provide the load from various locations. These systems must be purchased or leased and be maintained by the service provider, thus causing the service provider to incur considerable cost and expense. It would be desirable to provide testing from different locations on the network dynamically, to more closely emulate the real world environment the web site or software component will see when actually deployed, and to do so without incurring the expense of purchasing and maintaining multiple systems at remote locations.

SUMMARY OF THE INVENTION

With the foregoing background in mind, it is an object of the present invention to provide a method of performing distributed load testing. Loads are presented to the desired web site or software component from a variety of systems located through out the world. Unlike prior systems which are limited to using commonly owned systems which are on a common intranet, the presently described method is able to utilize a variety of systems from across the world to provide loads from different parts of the world, in effect creating a worldwide community Quality Assurance lab. Utilizing systems selected from a large variety of systems located throughout the world provides a test environment that more accurately emulates a real world environment.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood by reference to the following more detailed description and accompanying drawings in which:

Fig. 1 is a diagram of the system used to perform the present method.

DETAILED DESCRIPTION

Referring to Fig. 1 a system 1 is shown by which distributed load testing is performed. In one embodiment it is desired to test a web site 30 (the target web site). The web site 30 may be load tested, that is provided with a predetermined number of virtual users which access the web site 30 across a network such as Internet 40. The virtual users perform a variety of functions or transactions with the web site 30, much as the web site would experience in a real world environment. In a preferred embodiment system owners sign up their systems to be used to generate loads during times when their system would otherwise be inactive. Systems 50, 60, 70, 80 are registered through a service-provider web site 20 to form a catalog 25 (dynamic or static) of systems that are available to provide load. The catalog 25 includes a list of entries, one entry for each registered system. The entry may include information about the characteristics of the system. This information may include the location of the system, the IP address of the system, the size or speed of the system, and the availability of the system. Other

characteristics of the system may also be included. A scheduler 10 is used to schedule the desired loads, such that a request for loads from a predetermined number of systems and/or a predetermined geographical area can be provided.

In a particular example, the owner of a target web site 30 may desire that the target web site 30 be tested from 10:00 p.m. until 1:00 a.m. with load agents from systems physically located in Boston, Seattle and Chicago. While only three systems are described here, this is done for simplicity to explain the concepts of the present invention. In actual use, a large number of systems are utilized in accordance with the present invention. The load agents may be scripts available from a load test tool such as e-Load® offered by Empirix Inc. of Waltham, Massachusetts. The scheduler 10 parses through the catalog 25 to identify systems that are available which meet the specified criteria. Having identified the appropriate systems to use to generate loads, the scheduler 10 schedules each identified system to run its load agents to the target web site 30 across Internet 40 at the appropriate time. Therefore, at 10:00 p.m., the system 50 in Boston at IP address 1.1.1.2, the system 80 in Chicago at IP address 1.1.1.3, and the system 60 in Seattle at I.P Address 1.1.1.7 run their load agents to generate a number of virtual users accessing the target web site 30 across Internet 40. In such a manner the target web site 30 is being load tested by traffic being generated from different parts of the country.

The next day, the web site owner may desire that the same tests be run from the same sites at the same time. Given the dynamic nature of the catalog, the system in Boston may be a different system than the one used the previous time. Accordingly, the loads may be coming from a different physical location through a different path of routers and switches to exercise the target web site.

Alternately, the web site owner may request that the target web site 30 be tested from 10:00 p.m. until 1:00 a.m. with load agents from systems in Boston, New York and Chicago. Again the scheduler 10 parses through the catalog 25 to identify systems that are available which meet the specified criteria. Having identified the appropriate systems to use to generate the loads, the scheduler 10 schedules each identified system to run its load agents to the target web site 30 at the appropriate time. Therefore, at 10:00 p.m., the system 50 in Boston at IP address 1.1.1.2, the system 80 in Chicago at IP address 1.1.1.3, and the system 70 in New York at I.P Address 1.1.1.5 run their load agents to generate a

number of virtual users accessing the target web site 30 across Internet 40. In such a manner the target web site is being load tested by traffic being generated from different parts of the country. Again these loads are taking different paths to access the target web site, thus providing a more realistic testing environment which more closely resembles the type of traffic the target web site will experience in actual use. The loads may be deployed to a target web site which hasn't been publicly deployed yet to determine how the web site will perform when the web site is available to the public. The loads may also be deployed to a target web site which is available to the public to ensure the web site is performing as expected.

It should be noted that while only a few catalog entries were used for this explanation, this was done merely for simplicity. In use, the catalog would contain any number of available systems for providing distributed load. While load testing was described, the method could also be used for monitoring of a target web site. Monitoring is used to provide testing of deployed Web Applications in order to detect and report performance problems. Monitoring software may be e-Monitor® available from Empirix Inc. of Waltham, Massachusetts. The monitoring provided by the systems report failures in real time. The monitor software may provide a variety of notification options and corrective actions to allow the web site owner to quickly resolve any problems.

In an additional embodiment it is desired to test a software component. The software component may comprise an application, objects such as an Enterprise Java Bean (EJB) available from Sun Microsystems, CORBA available from IBM, or COM, DCOM and COM+ available from Microsoft Corporation, or a collection of objects. Systems are registered through a service-provider web site to form a catalog of registered systems that are available to provide load to the component under test. The catalog includes a list of entries, one entry for each available system. The entry may include information about the characteristics of the system. This information may include the location of the system, the IP address of the system, the size of the system, and the availability of the system. Other characteristics of the system may also be included. A scheduler is used to schedule the loads, such that a request for loads from a predetermined number of systems and/or a predetermined geographical area can be provided.

In a particular example, the owner of the software component to be tested may desire that the software component be tested from 10:00 p.m. until 1:00 a.m. with load agents from Boston, Seattle and Chicago. The load agents for testing a software component may be scripts available from a software component test tool such as Bean-
5 test™ available from Empirix Inc. of Waltham, Massachusetts. The scheduler parses through the catalog to identify systems that are available which meet the specified criteria. Having identified the appropriate systems to use to generate load, the scheduler schedules each identified system to run its load agents on the software component across the Internet at the appropriate time. Therefore, at 10:00 p.m., the system in Boston at IP
10 address 1.1.1.2, the system in Chicago at IP address 1.1.1.3, and the system in Seattle at I.P Address 1.1.1.7 run their load agents to generate a number of virtual users accessing the software component. In such a manner the software component is being load tested by traffic being generated from different parts of the country.

As stated above, the ability to test a web site or software component with loads
15 generated from systems physically located throughout the world provides testing which more closely emulates a real world environment. Additionally, the cost of implementing such a system is kept at a minimum since the service provider does not need to own and/or maintain the various systems registered with the service provider.

Having described preferred embodiments of the invention it will now become
20 apparent to those of ordinary skill in the art that other embodiments incorporating these concepts may be used. Additionally, the software included as part of the invention may be embodied in a computer program product that includes a computer useable medium. For example, such a computer usable medium can include a readable memory device, such as a hard drive device, a CD-ROM, a DVD-ROM, or a computer diskette, having
25 computer readable program code segments stored thereon. The computer readable medium can also include a communications link, either optical, wired, or wireless, having program code segments carried thereon as digital or analog signals. Accordingly, it is submitted that that the invention should not be limited to the described embodiments but rather should be limited only by the spirit and scope of the appended claims.